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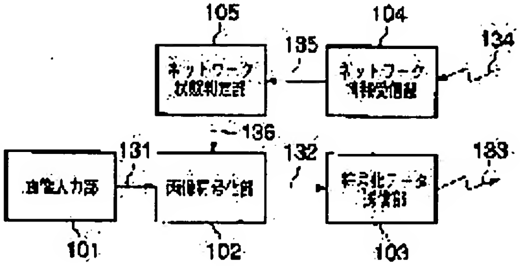
(54) DEVICE AND METHOD FOR DATA TRANSMISSION

(57)Abstract:

PROBLEM TO BE SOLVED: To realize real time data communication which packet loss and delay do not occur so much matching the current network state in a data transmission system.

SOLUTION: This data transmission system is provided with a means 105 for estimating the transmission state of a transmission path at least on the basis of either jitter or a packet loss rate as supplemental information obtained from a receiving side by a transmitting side, and a means 102 for changing and controlling notification of at least the bit rate or the error resistance level of transmission data in the transmitting side, based on the estimated transmission state. This invention utilizes the characteristics of an RTP(Real-time Transport Protocol) which is provided with a mechanism (RTCP(Real Time Control Protocol) for notifying the jitter, the packet loss rate, etc., as supplemental information from the transmitting side and the receiving side. The transmitting side adjusts the bit rate of the transmission data and changes error resistance levels correspondingly with a transmission path state on the basis of the notification of the jitter, the packet loss rate, etc., as supplemental information obtained from the receiving side.



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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the data transmission unit with which the information-transmission approach of transmitting the encoded dynamic image/static image using radio networks, such as wire nets, such as ISDN (Integrated ServicesDigital Network) and the Internet, or PHS (Personal Handy-phone System), and satellite communication, and its approach are applied.
[0002]
[Description of the Prior Art] In recent years, development of the application using these prospers by progress of the digital coding technique of various information including an image and a broadband network technique, and the system which transmits the image which carried out compression coding using a communication network is developed.
[0003] for example, it is shown in drawing 13 -- by the time, the picture signal 131 inputted from the image input section 101 is encoded in the image coding section 102, the obtained coded data 132 is given to the coded data transmitting section 103, and it transmits to a transmission line as transmit data 133. Thus, although an image is encoded and it transmits, in recent years, the application and the system which packet-ize data, and transmit and receive them by the spread of the Internet intranets have been increasing. Packet-ization serves as a very effective means for two or more efficient users to share the band of a channel.
[0004] By the way, TCP/IP (Transmission Control Protocol/Internet Protocol), UDP/IP (User Datagram Protocol/Internet Proto), etc. exist as a protocol which transmits and receives packet data with the Internet intranet.
[0005] Among these, TCP/IP is an Internet standard protocol and is a protocol applied to not only the Internet but intranet, LAN, etc. as a protocol which spread most globally. TCP works by the 4th layer transport layer of an OSI basic reference model, and IP works by the 3rd layer network layer.
[0006] Moreover, UDP is a connectionless mode protocol to UDP/IP being one of the transport layer protocols of a TCP/IP sweet, and TCP being a connection mode protocol. The application of a high order is identified using a port number like TCP. It uses for carrying the short data for network supervisory control, and audio data or real-time orientation data like video data in many cases.
[0007] By the way, since frameworks, such as resending, are incorporated, it is strong to an error etc., and even if TCP/IP takes time amount somewhat, it is [among these] effective at the application of the download mold which wants to receive data correctly. However, to the application which can ask for real time nature on the other hand, it is powerless.
[0008] On the other hand, while UDP/IP does not have the framework of resending, it is very effective in the application which there is no delay concerning resending etc. and can ask for real time nature.
[0009] Although transmission of a dynamic image is raised as an example of representation of the application which can ask for real time nature, in the usual dynamic-image communication link, image data is the very huge amount of data, and it is not fitting in a network band in most cases. In that case, image data is encoded and the technique of transmitting, after making the amount of data small is used.

The method which combined techniques, such as a motion compensation, a discrete cosine transform (DCT), sub band coding, pyramid coding, and variable length coding, and these as a compression coding technique of a dynamic-image signal is developed.
[0010] And as an international-standards method of dynamic-image coding, it is ISO. MPEG-1, MPEG-2, ITU-T As an international-standards method which multiplexes the sign train which H.261, H.262, and H.263 existed, and compressed the dynamic image, and voice and an audio signal, and other data, it is ISO. An MPEG system, ITU-T H.221 and H.223 exist.
[0011] The Internet etc. is connected through the countless network and it is common not to know which network is what kind of situation. Moreover, since the amount of data which is flowing there is changed every moment, the structure which judges what data can communicate on real time is required.
[0012] Then, it progresses further 1 step from the real-time application using UDP/IP, and the application which uses the packet format called RTP (Real-time Transport Protocol) which added and transmits a hour entry etc. to a packet has been increasing.
[0013] This RTP is a protocol for carrying out the real-time transfer of audio data and the video data which were specified by RFC1889, and it puts on UDP (User Datagram Protocol), and usually carries to it. It is a thing supposing applying to a multi-media system like video conferencing, and data can be delivered and received by the real-time conversational mode formula. However, there is no QA function of tone quality or image quality. Real-time operation is supported by attaching the sequence number and the time stamp (time stamp data) of a packet in a RTP header.
[0014] In addition, RFC is Request. for It is the abbreviated name of Comments and the thing of the design proposal which IETF (Internet Engineering Task Force) which is the ED organization of the Internet exhibits, or the document of a comment is pointed out. Many de facto standards like various kinds of protocols of a TCP/IP sweet are described by RFC.
[0015] And the hour entry and the packet number were added to the packet, could display voice and an image, the packet which sequence replaced in the network was judged, and detecting etc. came to be able to perform that the packet has lost by seeing a packet number by using this RTP using the right hour entry at a receiving side.
[0016] And RTP is equipped also with the structure (RTCP) which notifies a jitter (delay information), a packet loss ratio, etc. as extra information from a transmitting side or a receiving side. However, depending on application, it is not decided by specification how the information on this RTCP will be used.
[0017] Moreover, in the case of an image, it is necessary to compress and to send a picture signal by coding methods, such as MPEG, as mentioned above, from the raw band for picture transmission not being securable, in a network band. This becomes very weak to the packet loss by pouring data, or mixing of an error at the conversely unstable Internet, although there is effectiveness in reduction in the amount of data. Since a dynamic-image coding method transmits only difference with a front frame, this becomes a problem with very big some data being missing. When UDP and RTP are used, since resending of data is not performed, a cure on this problem is fundamentally required for it.
[0018] By the way, in image coding, the two modes usually exist. It is in the interframe coding mode (P Picture) in which difference with the frame before mentioning above is sent, and coding mode in a frame (I Picture) which encodes by closing in one frame. Usually, as shown in drawing 19 , the coding mode in a frame (I-Pic in drawing) is formed to suitable timing, and interframe coding mode (P-Pic in drawing) is formed among them. Spacing which encodes a frame in this coding mode in a frame is called GOP (Group of Pictures) spacing. Here, in order to decode based on the broken image if it is encoding in interframe coding mode after it when lack of data occurs and a certain decode image (for example, 1000 in drawing) has broken, as shown in drawing 20 , all subsequent decode images will be influenced and can decode correctly. Therefore, as shown in drawing 21 R> 1, by inserting the frame (for example, 1001 in drawing) encoded in the coding mode in a frame on the way, propagation of the effect of an error is cut off there and the means to recover is used.
[0019]
[Problem(s) to be Solved by the Invention] Although it has judged that a network had an error in the

Prior art, it was unknown how it was used. Moreover, although structure which notifies network information to a transmitting side in an original form was considered, it became a specification original with the application, and there was no versatility.
[0020] For example, as shown in drawing 14 at most, it is extent which controls image coding processing of the image coding section 102 in the range of the information which receives transmit data 133 using the receiving-side information receive section 1401, and is received from a network side in this transmitting path.
[0021] Moreover, by the condition judging of the conventional network, it has thought [being called network congestion]. However, the need of taking the error in a wireless environment etc. into consideration further comes out because the Internet spreads by the mobile environment. However, such measures are not taken at all with a current technique.
[0022] Furthermore, even when it corresponded to an error, the network condition changed and consideration was not made about the case where an error rate etc. does not become fixed, either. Since it corresponds when there are many errors, if GOP spacing is set up narrowly, coding with the coding mode in a frame will increase, and coding effectiveness will worsen. When there are many errors regularly, there may be the need of changing into such a condition, but by the normal state, there is almost no error, and when it is the network which an error generates only at a certain moment, this serves as very big futility. On the contrary, when GOP spacing was set up for a long time, there was a problem that the effect of [when an error occurs] will become large.
[0023] Then, its attention is paid to use of the real-time transfer using RTP.
[0024] By using RTP which is a protocol for carrying out the real-time transfer of audio data or the video data, as mentioned above, a hour entry and a packet number are added to a packet, using a right hour entry, can display voice and an image, the packet which sequence replaced in the network is judged, or detecting etc. can perform that the packet has lost by seeing a packet number at a receiving side.
[0025] And RTP is equipped also with the structure (RTCP) which notifies a jitter, a packet loss ratio, etc. as extra information from a transmitting side or a receiving side.
[0026] This invention was made in consideration of the above-mentioned situation, and uses the description of such RTP. Based on the notice of the jitter as extra information, a packet loss ratio, etc. obtained from the receiving side in the transmitting side As it can control adjusting a transmission rate or changing error resistance according to the transmission condition of a transmission line etc., it can be made to carry out to the maximum extent data transmission efficiently. It aims at offering the data transmission unit and the data transmission approach which were made available enough also about transmission as which real time nature is required.
[0027]
[Means for Solving the Problem] According to a means to presume the transmission condition of a transmission line at least based on the notice of either delay information (jitter) or a packet loss ratio and this presumed transmission condition as extra information acquired from a receiving side in a transmitting side, it is having-means which carries out modification control at least of one side characterized by this invention among the bit rate of the transmit data in a transmitting side, or error resistance level.
[0028] Moreover, a supply means to supply the coded data which this invention was prepared in the transmitting side, and the transmission rate was changed to the same contents, respectively, and was encoded, A means to presume the transmission condition of a transmission line based on the notice of either delay information or a packet loss ratio at least as extra information acquired from a receiving side in a transmitting side, It considers as the having-selection means to choose coded data of optimal transmission rate among coded data which said supply means supplies that bit rate of transmit data in transmitting side should be adjusted according to this presumed transmission condition description.
[0029] Moreover, a network information receiving means to receive the network information concerning [this invention] a network condition, A network condition judging means to judge a network condition from said network information acquired with said network information receiving means, An image

coding means by which either is controlled by network status information which carries out coding processing of the data which should be transmitted, and was judged by said network condition judging means at least among a bit rate or error resistance, It is characterized by having a transmitting means to transmit the image coded data outputted from said image coding means to a network.
[0030] Moreover, this invention is set to the data transmission unit which transmits the encoded coded data to a network. A network information receiving means to receive the network information about a network condition, A network condition judging means to judge a network condition from said network information received with said network information receiving means, A coded data change means to change from the coded data encoded according to a transmission rate different, respectively, and to choose and output the coded data of the transmission rate corresponding to information, The transmission rate of the coded data which transmits from said transmitting means is chosen from the network status information outputted from said network condition judging means, and it is characterized by providing the coded data selection means given as said change information to said coded data change means.
[0031] [1] Moreover, an image input means by which this invention captures an image and an image coding means to encode the picture signal with which it was outputted from said image input means, A transmitting means to transmit the image coded data outputted from said image coding means to a network, A network information receiving means to receive the network information about a network condition, It has a network condition judging means to judge a network condition from said network information received with said network information receiving means. Said image coding means is characterized by being controlled by network status information judged by said network condition judging means.
[2] Moreover, this invention is characterized by inputting into said network condition judging means the coding parameter information determined with said image coding means in the equipment of [1].
[3] Moreover, set this invention for said network condition judging means of the image sending set about said second invention. A coding parameter information storing means to store the coding parameter information that it was inputted from said image coding means, It has a network information storing means to store the network information inputted from said network information receiving means. A network condition from the network information inputted from said network information receiving means, the coding parameter information on the past outputted from a coding parameter information storing means, and the network information on the past outputted from said network information storing means It is characterized by what is judged.
[4] Moreover, this invention is characterized by having a coding parameter decision means to determine a coding parameter in said image coding means in the equipment of [1] from the network status information inputted from said network condition judging means.
[5] Moreover, in said coding parameter decision means in the equipment of [4], when this invention determines a coding parameter using said network status information, it is characterized by having a coding judging means in a frame to judge whether the following frame is compulsorily encoded by coding in a frame.
[6] Moreover, a transmitting means to transmit the coded data by which this invention was encoded to a network, A network information receiving means to receive the network information about a network condition, A network condition judging means to judge a network condition from said network information received with said network information receiving means, A coded data change means to choose and output one from the input of the coded data by which plurality was encoded, It is characterized by having a coded data selection means to choose the coded data which transmits from said transmitting means from the network status information outputted from said network condition judging means, to change to said coded data change means, and to output information.
[7] Moreover, this invention is characterized by to have a change location detection means detect the switchable location of coded data, to change with said change location detection means, when a coded data change signal comes using said change information outputted from said coded data selection means, to detect a location and to change coded data in said change location in the coded data change

means of the equipment of [6].
[0032] In addition, this invention concerning equipment is materialized also as invention concerning an approach, and this invention concerning an approach is materialized also as invention concerning equipment. Moreover, this invention concerning equipment or an approach is materialized also as a program (or in order to realize the function which is equivalent to the invention concerned at a computer in order to operate a computer as a means equivalent to the invention concerned) for making a computer perform the procedure equivalent to the invention concerned, and is materialized also as a record medium which recorded this program and in which computer read is possible.
[0033] This invention equips RTP with the structure (RTCP) which notifies delay information (jitter), a packet loss ratio, etc. as extra information from a transmitting side or a receiving side using the description of RTP. Based on the notice of the jitter as extra information, a packet loss ratio, etc. obtained from the receiving side in the transmitting side, the bit rate of the transmit data in a transmitting side is adjusted according to the transmission condition of a transmission line, or it controls changing error resistance level etc.
[0034] Therefore, according to this invention, as data transmission can be carried out efficiently to the maximum extent, data transmission made available enough also about transmission as which real time nature is required can be realized.
[0035]
[Embodiment of the Invention] Hereafter, the gestalt of implementation of invention is explained, referring to a drawing.
[0036] RTP which is a protocol for this invention to carry out the real-time transfer of audio data or the video data, Using RTCP based on the notice of the jitter (delay information) as extra information, a packet loss ratio, etc. obtained from the receiving side in the transmitting side According to the transmission condition of a transmission line, a transmission rate is adjusted, or data transmission can be efficiently been made to carry out to the maximum extent, as it can control changing error resistance etc., and a detail is explained hereafter.
[0037] (1st operation gestalt) Drawing 1 is the basic block diagram of the image sending set concerning the 1st operation gestalt of this invention. In drawing, 101 is the image input section, and 102 is the image coding section and carries out coding processing of the picture signal 131 inputted from the image input section 101 concerned.
[0038] 103 is the coded data transmitting section, processes the coded data 132 encoded by the image coding section 102 into the form which suited the network, and transmits to a receiving side. 104 is a network information receive section and is for receiving the network information 134 sent from the receiving side, and outputting it to the network condition judging section 105. This network condition judging section 105 judges a network condition from the network information 135 outputted from the network information receive section 104, and has the function notified to the image coding section 102 by making that result into the network status information 136.
[0039] In addition, although the image coding section 102 uses the network status information 136 and a picture signal 131 is encoded, this is performed as follows. That is, in RTP and RTCP, a packet loss ratio and delay information are given. Thereby, in the network condition judging section 105, a packet loss ratio is not "0", or if larger than a value with a time delay, a certain load will be applied to the network, and it is judged that the data of the assumed amount of data cannot be poured. Then, it constitutes so that processing in which issue directions (network status information 136) which lower a bit rate to the image coding section 102, and a setup of the target bit rate at the time of encoding is reset up low may be performed.
[0040] If such this equipment of a configuration inputs a picture signal 131 from the image input section 101, this inputted picture signal 131 will be encoded in the image coding section 102. And the coded data 132 encoded by the image coding section 102 is inputted into the coded data transmitting section 103.
[0041] In the coded data transmitting section 103, coded data 132 is processed into the form which was in the network, and it transmits to a receiving side. In the network information receive section 104, the

network information 134 sent from the receiving side is received, and it is outputted to the network condition judging section 105.
[0042] In the network condition judging section 105, a network condition is judged from the network information 135 outputted from the network information receive section, and it notifies to the image coding section 102 by making the result into the network status information 136.
[0043] In the image coding section 102, this notified network status information 136 is used, and a picture signal 131 is encoded.
[0044] As mentioned above, in RTP and RTCP, a packet loss ratio and delay information are given. Thereby, in the network condition judging section 105, a packet loss ratio is not "0", or if larger than a value with a time delay, a certain load will be applied to the network, and it is judged that the data of the assumed amount of data cannot be poured. So, in such a case, directions (network status information 136) which lower a bit rate to the image coding section 102 are taken out with the network condition judging section 105, and a setup of the target bit rate at the time of encoding is low reset to it.
[0045] A flow chart shows a very easy example of the judgment approach of the network condition in the network condition judging section 105 to drawing 10 . That is, in a procedure S1001, the packet loss ratio of network information is investigated and it judges ["0" and] whether that is right. Consequently, if there is packet loss, an effective bit rate will be computed from a packet loss ratio with a procedure S1002. This can be calculated by the formula (1) as shown below.
$b'=bx\,(1-r)$ -- (1) Here, b is [a new bit rate and r of a current bit rate and b'] packet loss ratios.
[0046] Next, in a procedure S1003, the parameter (coding parameter) for which it asked in said procedure S102 is notified to the image coding section 102. Here, it is for carrying out [in which rate control of the coding processing in the image coding section 102 and error resistance make a level decision], and in the image coding section 102, the above-mentioned parameter carries out adjustment control of the coding processing speed of the picture signal 131 inputted at this parameter correspondence, and change a bit rate, or frame spacing is changed, or it is used for adjustment of changing the level of error resistance.
[0047] On the other hand, when a packet loss ratio is "0" in a procedure S1001, parameter changing becomes nothing in a procedure S1004. This is an example of the decision approach and taking the decision approaches other than this can also be asked for a bit rate based on formulas the case where do not consider the decision criterion of a procedure S1001 as "0" and except [its], but it judges with a certain threshold, and other than the above-mentioned formula (1).
[0048] Thus, an image input means to capture an image in the 1st operation gestalt, An image coding means to encode the picture signal outputted from said image input means, A transmitting means to transmit the image coded data outputted from said image coding means to a network, A network information receiving means to receive the network information about a network condition, It has a network condition judging means to judge a network condition from said network information received with said network information receiving means. It is characterized by controlling processing actuation by network status information said image coding means was judged by said network condition judging means to be.
[0049] Therefore, by using this operation gestalt, when the band of a transmission network is unknown, or even when it changes at the middle, a parameter etc. is reset based on the network information on a receiving side, and it becomes possible to encode an image and to transmit with the parameter suitable for a current network. Dropping a bit rate automatically, even when a network is crowded by this, although it falls, delay occurs not much, or image quality becomes possible [communicating an image, without phenomena, like an image breaks by packet loss coming out]. This serves as an approach very effective in the picture transmission of real time.
[0050] In addition, the 1st operation gestalt can deform as follows and can be carried out. if an example is shown -- drawing 11 -- like -- it comes out. Examples other than drawing 10 of the judgment approach of the network condition in the network condition judging section 105 are raised to this drawing 11 . To the flow chart of drawing 10 having set up the parameter only with the packet loss ratio, by the approach of drawing 11 , if it investigated the amount of delay, consequently characteristic one is delayed by the

procedure S1104 beyond a certain value even when there is no packet loss, it judges that the network is crowded too here. And when it is judged that the network is crowded, in a procedure S1105, a bit rate is calculated using the following formula (2), and it considers as a new parameter.
b'=bx {(TN-TS)+(d-dth)} /(TN-TS) -- (2) Here, for a current bit rate and b', a new bit rate, time of day current in TN, and TS are [b / a time delay and dth of start time and d] the thresholds of a time delay.
[0051] The configuration of drawing 1 is developed and the example which gives the function which generates the network status information 136 in the network condition judging section 105, and was given to the image coding section 102 is shown in drawing 2 .
[0052] That is, in a configuration of being shown in drawing 2 , the function which generates the network status information 136 what kind of parameter setup should be carried out next from the function which acquires the present parameter of the present image coding section 102, and the present parameter and the network information 135 which this acquired in the network condition judging section 105, and is given to it at the image coding section 102 is given.
[0053] Since it means that the condition of the coding processing which the current line requires in the parameter 102, i.e., the image coding section, of an image in the network condition judging section 105 can be known in this configuration, it becomes possible to calculate and grasp a bit rate etc. in the direction of the network condition judging section 105. This becomes advantageous, when comparing the network information 135 with the parameter information 137 and judging a network condition. And a parameter will be changed so that it may become the optimal bit rate according to a network condition, and the structure which can give the image coding section 102 and can adjust coding processing can be realized.
[0054] This invention is doubled with the transmission condition of a transmission line. Thus, adjust transmission or Change error resistance, and adjustment of a transmission condition changes a bit rate, or perform it by changing frame spacing, and fluctuation of the quality of a transmission line is received. It doubles with the transmission condition of a transmission line, and error resistance is changed (for example, it carries out changing spacing of an MPEG4 synchronizing signal etc.). As condition correspondence of a transmission line can be transmitted by what error resistance is changed for, with data transmission can be carried out efficiently to the maximum extent, data transmission made available enough also about transmission as which real time nature is required is made possible.
[0055] Another example is shown in drawing 3 . In drawing 3 , the configuration of drawing 2 is developed further and it considers as the configuration which has the network information storing section 301 which stores the network information on past in the network condition judging section 105, and the coding parameter information storing section 302 which stored the coding parameter information which has applied the present image coding section 102. From these, the network condition judging section 303 gets to know the network information on past, and a current coding parameter, determines the optimal parameter which judges time transition of a network condition from these, and is given to the image coding section 102, and gives it to the image coding section 102.
[0056] According to this configuration, the description it is featureless to it being possible to judge a network condition to accuracy more by seeing transition of time network information is acquired. The flow chart of the network condition judging approach in the case where this method is used for drawing 12 is shown.
[0057] When processing of the network condition judging section 303 is explained according to this flow chart, it judges whether the network condition judging section 303 has packet loss in a procedure S1201 first and there is packet loss as a result of that judgment, it judges whether also last time, packet loss had occurred with a procedure S1202. Consequently, if the loss ratio is compared and this packet loss ratio has exceeded from the last packet loss ratio when packet loss has occurred also last time, it can be judged that the last correction was not effective.
[0058] The band over of transmission data like network congestion is not a problem, but a thing like a noise occurs on a circuit and this can be judged that possibility of destroying data means the high thing. Therefore, the network condition judging section 303 is not changed in a bit rate in a procedure S1204, but sets up a parameter which becomes strong to an error, and notifies it to the image coding section 102

in a procedure S1205.

[0059] The network condition judging section 303 re-calculates an effective bit rate from a packet loss ratio in a procedure S1206 noting that the last modification is working effectively, if this packet loss ratio is less than the last packet loss ratio in the procedure S1203. Moreover, when packet loss has not occurred last time in a procedure S1202, this loss progresses to the noise of a circuit, a judgment, and a procedure 1204.

[0060] On the other hand, when the network condition judging section 303 does not have packet loss in a procedure S1201, it will progress to a procedure S1207 and will investigate the amount of delay. And when the amount of delay exceeds a threshold Th as a result, an effective bit rate will be calculated from the amount of delay in a procedure S1208, and a procedure S1205 will notify to the image coding section 102.

[0061] Suppose that it judges that the communication link good when the amount of delay is not over the threshold Th in a procedure S1207, either has finally done the network condition judging section 303, and a parameter is not changed especially in a procedure S1209.

[0062] The function which can judge whether circuit conditions, such as network congestion, and it, wireless, have the bad packet loss which has occurred in the network condition judging section 105 on the transmission line, the noise occurred, and loss has occurred by making such processing perform in the network condition judging section 303 can be given now.

[0063] If control which this is an example, does not judge that the case where there is no packet loss last time is a noise in a procedure S1202, but thinks that is network congestion conversely, and lowers a bit rate is performed or this packet loss ratio is improved from the packet loss ratio last in a procedure S1203, it will investigate what kind of change was made last time, and making the same parameter change as it will also be considered. Thus, it is possible to double and set various judgment methods as a network by this method.

[0064] The above is determined in the network condition judging section 105, and although the example in which the image coding section 102 carries out coding processing based on the given coding parameter was shown, it can also consider as the configuration which determines a parameter not by the network condition judging section 105 but by the image coding section 102. The example is shown in drawing 4 .

[0065] A block diagram including the configuration in the case of determining a coding parameter as drawing 4 in the image coding section 102 is shown. In the case of this example, the image coding section 102 consists of the coding parameter decision section 401 and the signal-processing section 402.

[0066] In this configuration, the network condition judging section 105 is taken as the configuration which outputs the network status information 136 from the network condition judging section 303, and is given to the image coding section 102.

[0067] In such a configuration, the network status information 136 taken out from the network condition judging section 303 is given to the image coding section 102 in the network condition judging section 105. Then, the network status information 136 is first inputted into the coding parameter decision section 401, and the coding parameter decision section 401 makes the coding parameter 431 of the form which got to know the network condition from this network status information 136, and suited the network condition generate in the image coding section 102.

[0068] The generated coding parameter 431 is inputted into the signal-processing section 402. Then, this signal-processing section 402 uses this coding parameter 431, and encodes the picture signal 131 inputted from the image input section 101.

[0069] The encoded information 432, such as the amount of signs after coding, is inputted into the coding parameter decision section 401, and is used in the case of next coding parameter decision. The coded data 132 encoded in the signal-processing section 402 is outputted to the coded data transmitting section 103.

[0070] Drawing 5 is the block diagram having shown the configuration containing the coding judging section 501 in a frame which sets up coding in a frame compulsorily in the coding parameter decision section 401 shown by drawing 4 . As shown in drawing, the coding parameter decision section 401 is

equipped with the coding judging section 501 in a frame, and the coding parameter decision section 502, and is constituted.
[0071] In this configuration, the network status information 136 outputted from the network condition judging section 105 is inputted into the coding parameter decision section 502 which the coding parameter decision section 401 has, and the coding parameter information 531 on network status information 136 correspondence is outputted from the coding parameter decision section 502 concerned.

[0072] the coding parameter information 531 being inputted into the coding judging section 501 in a frame, and performing interframe coding as it is -- or it judges whether it is made a compulsive target to coding in a frame. When judged as coding in a frame, the coding parameter information 531 is updated so that coding in a frame may be performed, and is outputted to the signal-processing section 402 of the image coding section 102 in drawing 4 as coding parameter information 431 here.
[0073] If correctly receivable [after parameter modification] by doing in this way even if earlier data is not correctly transmitted to a receiving side, it will become the configuration which can reproduce a right image.
[0074] It is also possible to give a function which constituted the image coding section which has the function of the image coding section 102 and the network condition judging section 105, and in which a network condition judging is possible, and has been mentioned above in one block.
[0075] In the coding parameter decision section 401 or the network condition judging section 105, although a judgment in connection with the next coding parameter setup is made, image quality may be changing rapidly by the instability of a temporary network at an image conversely hard to see. In order to control such a phenomenon, it is also possible to put in the device in which fluctuation of a coding parameter is pressed down within a certain amount of limits, and it functions effectively in the above situations.
[0076] Although a setup of a bit rate and a setup of an error resistance parameter may be set up as what was computed, it is also possible to take the approach of deciding the pattern somewhat beforehand, for example and choosing the nearest thing out of it. Moreover, how to be not the nearest thing but as follows [the bit rate computed in the bit rate], and use [choose / the nearest thing] is also possible. It can prevent the image of the image quality which this does not expect with the combination of various parameters coming out, and it becomes possible to prepare the combination of a coding parameter [finishing / a test / to some extent].
[0077] In the above example, when a packet loss ratio is not "0" or delay exceeds a threshold, parameters, such as a bit rate and error resistance, were changed and control which is reset as the parameter suitable for the present condition has been performed.
[0078] However, a network condition is recovered and it is also possible to perform control which packet loss stops occurring, raises a bit rate conversely when delay becomes small, or weakens an error resistance parameter.
[0079] Such an example is explained below as 2nd operation gestalt.
[0080] (2nd operation gestalt) Drawing 6 is the basic block diagram of the image sending set concerning the 2nd operation gestalt of this invention. In drawing 6 , as for an are recording medium and 602, 601 is [the coded data change section and 603] the coded data selection sections, and, as for the coded data transmitting section and 104, 103 is [a network information receive section and 105] the network condition judging sections.
[0081] Among these, the are recording medium 601 shall be for saving the coded data 631 of the contents encoded beforehand, and shall have more than one. To each are recording medium 601, the coded data of the same contents encoded with a coding parameter different, respectively is saved.
[0082] Carrying out the selection change of the are recording medium 601 so that the coded data change section 602 may give the coded data 631 which chooses one of the are recording media 601 of these plurality, and is held at that selected are recording medium 601 to said coded data transmitting section 103, this selection is a configuration carried out according to the change information 632 from the coded data selection section 603.

[0083] The network information receive section 104 has the function to receive the transmit data from a receiving side, to receive the network information 134 sent from a receiving-side and network side, such as a packet loss ratio and delay information, and to give this to the network condition judging section 105 as network information 135.
[0084] Moreover, the network condition judging section 105 judges a network condition from the inputted network information 135. It is what is outputted to the coded data selection section 603 by making the result into the network status information 136. It guesses whether the coded data selection section 603 has the optimal coded data of this network status information 136 to which coding parameter to a current network. It has the function which outputs the change information 632 for changing to the coded data change section 602 that the coded data based on the guessed optimal coding parameter should be considered as an output, and should be chosen.
[0085] In the coded data change section 602, based on this change information 632, one coded data will be chosen from the inputted coded data 631, and coded data 132 will be outputted.
[0086] In such a configuration, the coded data 631 which was encoded beforehand and saved to the are recording medium 601 etc. will be inputted into the coded data change section 602, if it is made to reproduce from the are recording medium 601. That is, each coded data encoded with a different coding parameter by the are recording medium 601 which has more than one, respectively is held, and as a result of reproducing these, the coded data encoded with a coding parameter different, respectively will be inputted into the coded data change section 602. And the coded data change section 602 chooses one from this inside, and outputs it to the coded data transmitting section 103.
[0087] In addition, this selection is carried out according to the change information 632 from the coded data selection section 603.
[0088] On the other hand, it is received in the network information receive section 104, and the network information 134, such as a packet loss ratio from a receiving side and delay information, is sent to the network condition judging section 105. In the network condition judging section 105, a network condition is judged from the inputted network information 135, and it outputs to the coded data selection section 603 by making the result into the network status information 136.
[0089] In the coded data selection section 603, it guesses whether the coded data of which coding parameter is the the best for a current network from the network status information 136, and the change information 632 is outputted to the coded data change section 602.
[0090] In the coded data change section 602, based on this change information 632, one coded data is chosen from the inputted coded data 631, and coded data 132 is outputted.
[0091] A concrete example explains this operation gestalt. Now, five sets of the storages 601a-601e with which 384 [kbps], 128 [kbps], 64 [kbps], 32 [kbps], and five coded data encoded by 16 [kbps] were saved shall exist as an are recording medium 601.
[0092] The storage which saved the coded data of the contents encoded by 384 [kbps], for example Namely, storage 601a, The storage which saved the coded data of the contents encoded by 128 [kbps] Storage 601b, The storage which saved the coded data of the contents encoded by 64 [kbps] Storage 601c, The storage which saved the coded data of the contents by which the storage which saved the coded data of the contents encoded by 32 [kbps] was encoded with storages 601d and 16 [kbps] is storage 601e.
[0093] When the transmission line with the quality which can be transmitted by 384 [kbps] is used, the playback coded data based on storage 601a which saved the coded data of the contents encoded by 384 [kbps] first of all and which is a storage is made to choose, transmission is started by 384 [kbps], and reception of the network information from a receiving side is also started to coincidence.
[0094] Although network information is received at a certain spacing, a certain trouble is in a network using the information, and an effective bit rate is computed in the phase which turned out that packet loss and delay had occurred. And the coded data of the bit rate near the computed bit rate will be chosen in the coded data selection section 603, and it will change and transmit in the coded data change section 602.
[0095] For example, if the computed bit rate is 140 [kbps], 128 [kbps] has a value near this bit rate. In

this case, if the bit rate which chose the coded data which is reproducing storage 601b which saved the coded data of the contents encoded by 128 [kbps], changed, and was computed is 100 [kbps] 64 [kbps] has a near value with the bit rate not more than this, and it is the condition referred to as choosing the coded data which is reproducing storage 601c which saved the coded data of the contents encoded by 64 [kbps] in this case, and making it change.

[0096] This operation gestalt contents thus, to classification correspondence of a transmission bit rate Encode beforehand, prepare and it asks for the optimal current transmission rate based on network information which is the functions which RTP has, such as a packet loss ratio from a receiving side, and delay information. To the playback coded data output of the storage which saved the coded data from which the bit rate corresponding to this transmission rate is obtained, since it was made to carry out selection change ****** The need of processing in which it encodes on real time by the server side is lost, and it becomes possible [mitigating the load of a server]. In case especially this distributes images made beforehand, such as broadcast, it serves as a very effective means.

[0097] Here, the modification of the 2nd operation gestalt is described. This is a **** configuration shown in drawing 7 , and has shown the block diagram about the approach of performing control about the change timing of the coded data inputted here, in the coded data change section 602.

[0098] Coded data 631 changes, changes to the location detecting element 701, and is inputted into the section 702. The change information 632 is inputted in the change location detecting element 701. When it is necessary to perform a change from current coded data to other coded data using the change information 632, in the change location detecting element 701, coded data is analyzed and a switchable location is detected.

[0099] This means that the frame encoded for example, by coding (I-Picture) in a frame is looked for, and there is.

[0100] And it changes to the change section 702 and the change of coded data is directed in the place which became a switchable location using the directions information 731. What showed this situation by a diagram is shown in drawing 8 . Current selection is made and the coded data of A presupposes that the change information 632 needed to perform the change to the coded data of B.

[0101] At the time, it is assumed that the frame in the "change directions" time in drawing 8 was processed. In that case, if coded data is changed here, mismatching will arise in an image. Because, difference with a front image is encoded in interframe coding (P-Picture). Therefore, if coded data is changed at the time of P-Picture, the following image (image P11 of coded data (B)) tends to be reproduced using the last image (decode image I11 of coded data (A)).

[0102] Now, a right decode image is not obtained but there is a trouble that an image will break.

[0103] Then, the need of changing to the timing of the image of coding (I-Picture) in a frame which encodes only with the frame instead of difference with a front image comes out. This becomes the timing in the mark location of "change activation" of drawing 8 .

[0104] Moreover, also when the number of sheets and time amount location of a frame differ from each other for every coded data like drawing 9 , it thinks. In that case, the switchable location of the coded data of a change place is detected similarly, and it performs the change of coded data in the place which came to the possible location.

[0105] In the change location detecting element 701 of drawing 7 , when it is necessary to be a change for the change information 632, the approach of outputting new coded data to the coded data transmitting section 103 in the phase to which the output 132 to the coded data transmitting section 103 was temporarily suspended, and the change location came is also possible.

[0106] This is effective when overflow of a buffer etc. needs to be controlled by the change of coded data. Moreover, when an underflow becomes a problem conversely, inserting a stuffing bit etc. compulsorily can also cope with it.

[0107] (3rd operation gestalt) Next, the 3rd operation gestalt is explained.

[0108] This operation gestalt explains the example of a configuration at the time of adjusting the time interval (GOP spacing) encoded in the coding mode in a frame based on the network status information 136 outputted from the network condition judging section 105 in the coding parameter decision section

401 of the image coding section 102 of drawing 4 of the 1st operation gestalt. In addition, it explains here focusing on the point which is different from the 1st operation gestalt.

[0109] The example of a configuration of the coding parameter decision section 401 in this case is shown in drawing 15 . Thus, it has the GOP spacing count section 1501 and the coding parameter decision section 502, and is constituted.

[0110] The network status information 136 (here, packet loss ratio information shall be included at least) outputted from the network condition judging section 105 is inputted into the coding parameter decision section 502. In the parameter decision section 502, the packet loss ratio information 1531 on the network status information 136 is inputted into the GOP spacing count section 1501. In the GOP spacing count section 1501, GOP spacing is calculated from the packet loss ratio information 1531. The GOP spacing information 1532 is notified to the coding parameter decision section 401. In the coding parameter decision section 401, the coding parameter information 431 including the GOP spacing information 1532 that it was inputted is outputted (in addition, in the coding parameter decision section 401, when there is parameter information generated inside, the coding parameter information 431 including the GOP spacing information 1532 and the parameter information generated inside this is outputted).

[0111] A flow chart shows an example of an approach which determines GOP spacing in the GOP spacing count section as drawing 16 .

[0112] In a procedure S1601, it judges whether packet loss occurred from the network status information 136. When packet loss has occurred, in a procedure S1602, GOP spacing is presumed from the following formula (3).

gop=(TN-TL)/{(FN-floor line) xr} -- (3) Here, gop is GOP spacing and r is a packet loss ratio, a frame total current in FN, the frame total at the time of count of last time [floor line], time of day current in TN, and the time of day at the time of count of last time [TL].

[0113] GOP spacing called for in the procedure S1602 is notified to the signal-processing section 402 by the procedure S1603, and coding is performed based on this value.

[0114] On the other hand, when packet loss has not occurred in a procedure S1601, a GOP spacing value default in a procedure S1604 is read. And a procedure S1603 notifies this value to the signal-processing section 402.

[0115] According to this operation gestalt, it becomes possible to change GOP spacing to the value suitable for a network dynamically. Thereby, when there are few errors, it becomes possible to extend GOP spacing and to reduce the useless coding mode in a frame. On the contrary, when [that] there are many errors, it becomes possible to carry out recovery early because narrow GOP spacing and the frame in the coding mode in a frame appears early. With this operation gestalt, selection in the efficient coding mode in a frame is attained.

[0116] A flow chart shows other examples of the approach of determining GOP spacing in the GOP spacing count section as drawing 17 .

[0117] Even when there is no packet loss compared with the method of drawing 16 , in a procedure S1704, he presumes a network condition from the hysteresis of the past of packet loss, and is trying to calculate the optimal GOP spacing in this example. having changed into the condition that do not immediately return GOP spacing to a default noting that this technique does not have packet loss in a certain moment, but verify the past hysteresis, and a network does not have an error completely -- or the error makes it possible to presume whether it is still generating. The condition judging of a thereby more exact network is attained.

[0118] A flow chart shows the example of further others of the approach of determining GOP spacing in the GOP spacing count section as drawing 18 .

[0119] Determining GOP spacing has packet loss, and he does not perform the judgment by those without /, but is trying for the count method of a meaning to determine in this example. This can be used also when determining GOP spacing for which the past hysteresis was verified and it was most suitable also when GOP spacing was determined by one formula from a current packet loss ratio.

[0120] The following equation (4) shows the example of the formula at the time of determining GOP

spacing.
gop= [(TN-TL) /{(FN-floor line) xr}] xalpha -- (4) Here, gop is [a packet loss ratio and alpha of GOP spacing and r] sensitivity, a frame total current in FN, the frame total at the time of count of last time [floor line], time of day current in TN, and the time of day at the time of count of last time [TL].
[0121] In this example, it becomes possible to fill somewhat demand, the demand of an error that effect may be prolonged, etc. of wanting to recover early at the sacrifice of effectiveness when there is an error with multiplying sensitivity by GOP spacing computed from the actual value. For example, if sensitivity alpha is set up smaller than 1, GOP spacing shorter than GOP spacing calculated from the actual measurement will be outputted. Thereby, although effectiveness falls victim, when an error occurs, it becomes possible to count upon quite early recovery.
[0122] In addition, this operation gestalt is not limited to a formula (3) and (4). For example, although these formulas are computing the value using the increment from the time of count last time, it is also possible like the increment from n times before to take and calculate width of face. It corresponds to a loose change which hid into change of a fine condition by this, or it becomes possible to remove a temporary change to some extent. It is not limited to what showed the algorithm with this operation gestalt similarly.
[0123] Moreover, although the above explained the example of a configuration in the case of adjusting the time interval (GOP spacing) encoded in the coding mode in a frame based on the network status information 136 in the coding parameter decision section 401 of the image coding section 102 of drawing 4 of the 1st operation gestalt In the network condition judging section 105 (drawing 1 , drawing 2 , or drawing 3) of the 1st operation gestalt Based on the information from the network information receive section 104 or the information from the network information receive section 104, and the information from the image coding section 102, the time interval (GOP spacing) encoded in the coding mode in a frame is determined. The configuration given to the image coding section 102 is also possible.
[0124] Moreover, as the 1st operation gestalt described, it is also possible to give a function which constituted the image coding section which has the function of the image coding section 102 and the network condition judging section 105, and in which a network condition judging is possible, and has been mentioned above in one block.
[0125] As mentioned above, although various operation gestalten were explained In short, this invention equips RTP with the structure (RTCP) which notifies a jitter, a packet loss ratio, etc. as extra information from a transmitting side or a receiving side using the description of RTP. Based on the notice of the jitter as extra information, a packet loss ratio, etc. obtained from the receiving side in the transmitting side, the bit rate of the transmit data in a transmitting side can be adjusted according to the transmission condition of a transmission line, or it enables it to control changing error resistance level etc. Therefore, according to this invention mentioned above, as data transmission can be carried out efficiently to the maximum extent, data transmission made available enough also about transmission as which real time nature is required can be realized.
[0126] In addition, this invention is not limited to the operation gestalt mentioned above, can deform variously, and can be carried out. Moreover, in this invention, invention of various phases is included in the above-mentioned operation gestalt, and various invention may be extracted by the proper combination in two or more requirements for a configuration indicated. For example, even if some requirements for a configuration are deleted from all the requirements for a configuration shown in an operation gestalt, at least one of the technical problems stated in the column of Object of the Invention is solvable, and when at least one of the effectiveness stated in the column of an effect of the invention is obtained, the configuration from which this requirement for a configuration was deleted may be extracted as invention.
[0127] Moreover, the technique indicated in the operation gestalt in this invention can also be distributed by transmission which can also store and distribute to record media, such as magnetic disks (a flexible disk, hard disk, etc.), optical disks (CD-ROM, CD-R, CD-RW, DVD, MO, etc.), and semiconductor memory, as a program which a computer can be made to execute, and minds a network.

[0128]
[Effect of the Invention] According to this invention, a network condition is judged and it becomes possible to set up the parameter of coding the optimal. Moreover, when the packet loss by congestion and loss like a wireless error are intermingled to a network, it becomes possible to judge this and to set up a parameter. Therefore, according to this invention, as data transmission can be carried out efficiently to the maximum extent, the data transmission unit and the data transmission approach that data transmission made available enough also about transmission as which real time nature is required can be realized now can be offered.

[Translation done.]

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3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The data transmission unit by which it is having-means which carries out modification control at least of one side characterized according to a means to presume the transmission condition of a transmission line based on the notice of either delay information or a packet loss ratio at least and this presumed transmission condition as extra information acquired from a receiving side in a transmitting side among the bit rate of the transmit data in a transmitting side, or error resistance level.
[Claim 2] A supply means to supply the coded data which it was prepared in the transmitting side, and the transmission rate was changed to the same contents, respectively, and was encoded, A means to presume the transmission condition of a transmission line based on the notice of either delay information or a packet loss ratio at least as extra information acquired from a receiving side in a transmitting side, The data transmission unit by which it is having-selection means to choose coded data of optimal transmission rate among coded data which said supply means supplies that bit rate of transmit data in transmitting side should be adjusted according to this presumed transmission condition characterized.
[Claim 3] The data transmission approach by which it is carrying-out [based on the notice of either delay information or a packet loss ratio, presume the transmission condition of a transmission line at least as extra information acquired from a receiving side in a transmitting side, and / among the bit rate of the transmit data in a transmitting side, or error resistance level]-according to this presumed transmission condition-modification control at least of one side characterized.
[Claim 4] The coded data which the transmission rate was changed to the same contents in the transmitting side, respectively, and was encoded to it is prepared. While presuming the transmission condition of a transmission line based on the notice of either delay information or a packet loss ratio at least as extra information acquired from a receiving side in a transmitting side The data transmission approach by which it is transmitting [choose the coded data of the optimal transmission rate among said coded data, and] characterized that the bit rate of the transmit data in a transmitting side should be adjusted according to this presumed transmission condition.
[Claim 5] the process which carries out modification control at least of one side according to the process which presumes the transmission condition of a transmission line based on the notice of either delay information or a packet loss ratio at least and this presumed transmission condition as extra information acquired from a receiving side in a transmitting side among the bit rate of the transmit data in a transmitting side, or error resistance level -- since -- the program for performing becoming processing.
[Claim 6] A network information receiving means to receive the network information about a network condition, A network condition judging means to judge a network condition from said network information acquired with said network information receiving means, An image coding means by which either is controlled by network status information which carries out coding processing of the data which should be transmitted, and was judged by said network condition judging means at least among a bit rate or error resistance, The data transmission unit characterized by having a transmitting means to transmit the image coded data outputted from said image coding means to a network.
[Claim 7] While considering said coding means as the configuration which carries out coding processing so that it can give a coding parameter as said network status information and may obtain the coded data which carried out bit rate adjustment to this coding parameter correspondence A coding parameter information storing means to store the coding parameter information that said network condition judging means was acquired from said coding means, A network information storing means to store the network information inputted from said network information receiving means is provided. A network condition is judged from the network information inputted from said network information receiving means, the coding parameter information on the past outputted from a coding parameter information storing means, and the network information on the past obtained from said network information storing means. The data transmission unit according to claim 6 characterized by determining said coding parameter of said coding means.
[Claim 8] It is the data transmission unit according to claim 6 carry out carrying out as the configuration which carries out coding processing in order to obtain the coded data in which said coding means carried out bit rate adjustment at this determined coding parameter correspondence while said coding means possessed a coding parameter decision means to determine a coding parameter, from the network status information inputted from said network condition judging means as the description.
[Claim 9] Said coding parameter decision means is a data transmission unit according to claim 8 characterized by providing a coding judging means in a frame to judge whether the following frame is compulsorily encoded by coding in a frame when a coding parameter is determined using said network status information.
[Claim 10] It is the data transmission unit according to claim 6 or 7 which said network condition judging means is further equipped with a GOP spacing count means calculate GOP spacing from the network information inputted from said network information receiving means, creates network status information including the GOP spacing information which shows GOP spacing outputted from said GOP spacing count means, and is characterized by for said image coding means to perform image coding according to said GOP spacing information included in said network status information.
[Claim 11] Said image coding means is a data transmission unit according to claim 6 or 8 characterized by performing image coding according to the GOP spacing information which shows GOP spacing which was further equipped with a GOP spacing count means to calculate GOP spacing from the network information inputted from said network information receiving means, and was outputted from said GOP spacing count means.
[Claim 12] It is the data transmission unit according to claim 10 or 11 which said network condition judging means judges a packet loss

ratio at least as a condition of said network, and is characterized by said GOP spacing count means asking for said GOP spacing based on said packet loss ratio at least.
[Claim 13] In the data transmission unit which transmits the encoded coded data to a network A network information receiving means to receive the network information about a network condition, A network condition judging means to judge a network condition from said network information received with said network information receiving means, A coded data change means to change from the coded data encoded according to a transmission rate different, respectively, and to choose and output the coded data of the transmission rate corresponding to information, The transmission rate of the coded data which transmits from said transmitting means is chosen from the network status information outputted from said network condition judging means. The data transmission unit characterized by providing the coded data selection means given as said change information to said coded data change means.
[Claim 14] Said coded data change means is a data transmission unit according to claim 11 characterized by to provide a change location detection means detect the switchable location of coded data, to change with said change location detection means when a coded data change signal comes using said change information outputted from said coded data selection means, to detect a location and to change coded data in said change location.

[Translation done.]

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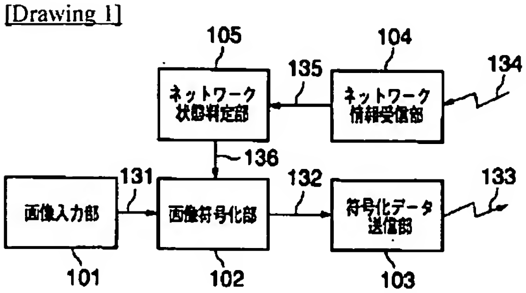
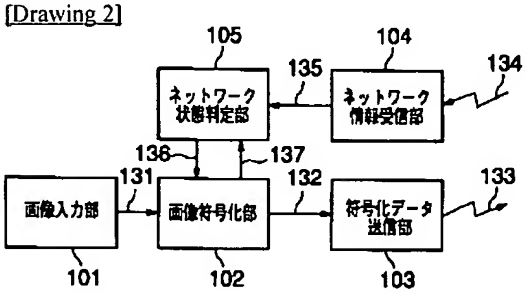
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

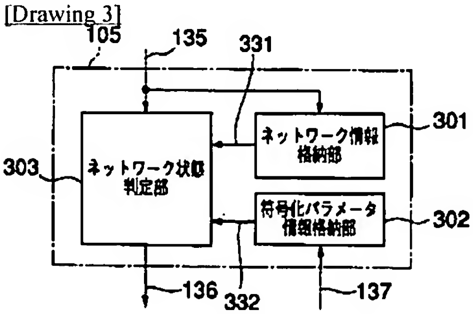
[Drawing 1]


105
104
135
134
ネットワーク状態判定部
ネットワーク情報受信部
136
131
132
133
画像入力部
画像符号化部
符号化データ送信部
101
102
103

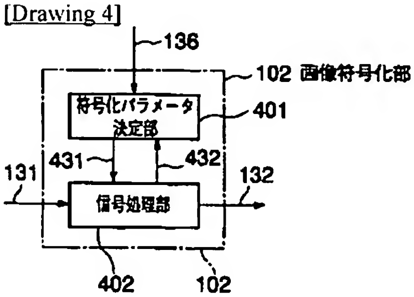
[Drawing 2]


105
104
135
134
ネットワーク状態判定部
ネットワーク情報受信部
136
137
131
132
133
画像入力部
画像符号化部
符号化データ送信部
101
102
103

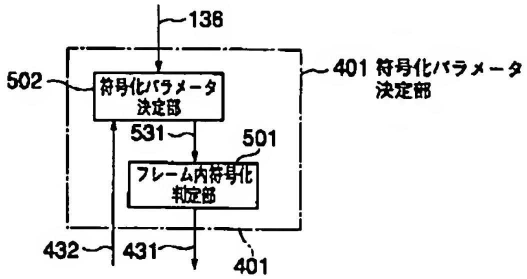
[Drawing 3]


105
135
331
ネットワーク情報格納部
301
303
ネットワーク状態判定部
符号化パラメータ情報格納部
302
136
332
137

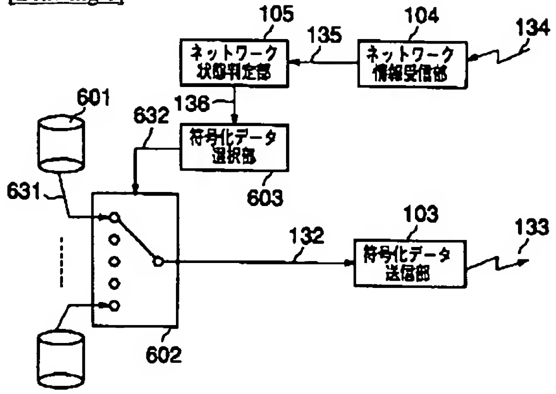
[Drawing 4]


136
102 画像符号化部
符号化パラメータ決定部
401
431
432
131
132
信号処理部
402
102

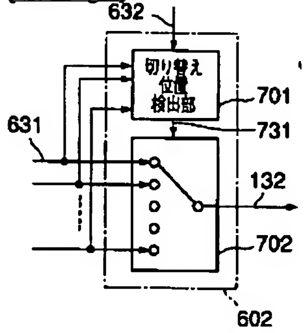
[Drawing 5]


136
502
符号化パラメータ決定部
401 符号化パラメータ決定部
531
501
フレーム内符号化判定部
432
431
401

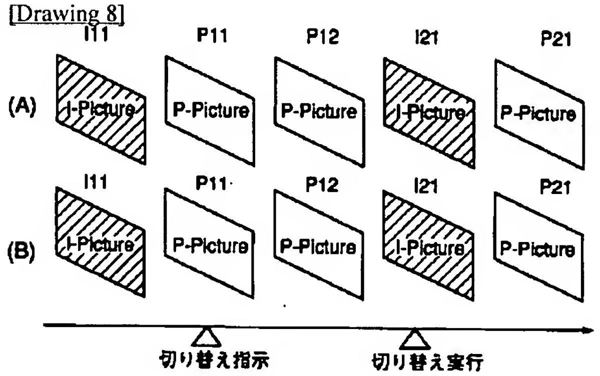
[Drawing 6]


105
135
104
134
ネットワーク状態判定部
ネットワーク情報受信部
601
632
136
符号化データ選択部
631
603
103
133
132
符号化データ送信部
602

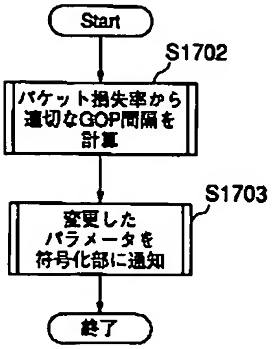
[Drawing 7]


632
切り替え位置検出部
701
731
631
132
702
602

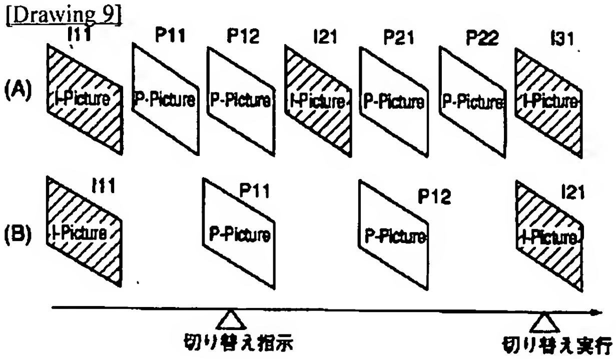
[Drawing 8]


I11
P11
P12
I21
P21
(A)
I-Picture
P-Picture
P-Picture
I-Picture
P-Picture
I11
P11
P12
I21
P21
(B)
I-Picture
P-Picture
P-Picture
I-Picture
P-Picture
切り替え指示
切り替え実行

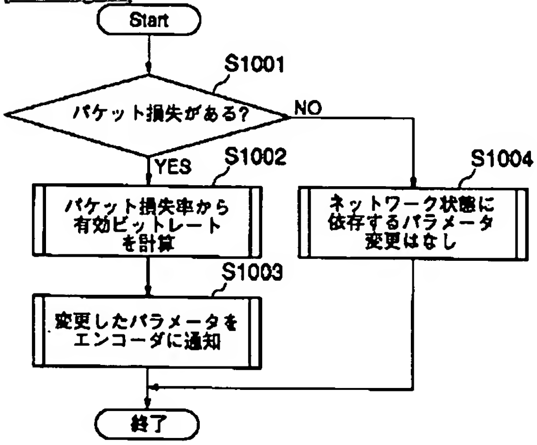
[Drawing 18]


Start
S1702
パケット損失率から適切なGOP間隔を計算
S1703
変更したパラメータを符号化部に通知
終了

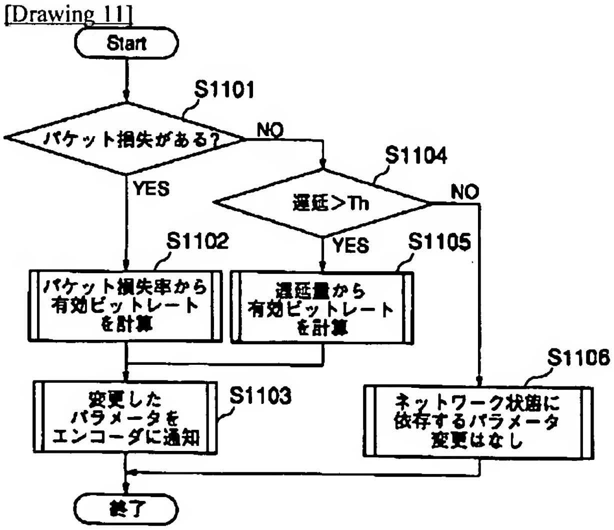
[Drawing 9]


(A)
I11
P11
P12
I21
P21
P22
I31
I-Picture
P-Picture
P-Picture
I-Picture
P-Picture
P-Picture
I-Picture
(B)
I11
P11
P12
I21
I-Picture
P-Picture
P-Picture
I-Picture
切り替え指示
切り替え実行

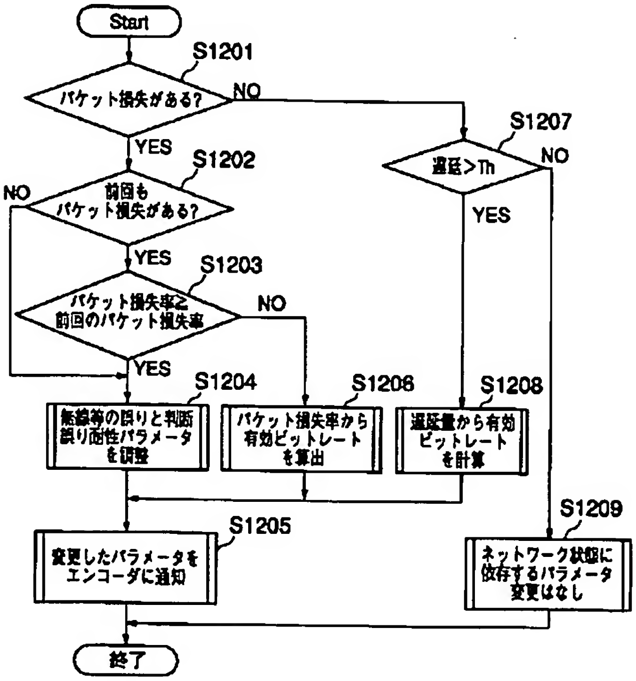
[Drawing 10]


Start
S1001
パケット損失がある?
NO
YES
S1002
パケット損失率から有効ビットレートを計算
S1004
ネットワーク状態に依存するパラメータ変更はなし
S1003
変更したパラメータをエンコーダに通知
終了

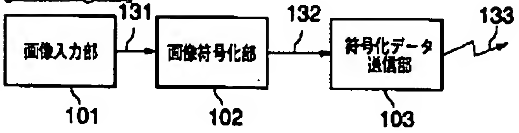
[Drawing 11]


Start
S1101
パケット損失がある?
NO
S1104
遅延>Th
NO
YES
YES
S1102
パケット損失率から有効ビットレートを計算
S1105
遅延量から有効ビットレートを計算
S1106
ネットワーク状態に依存するパラメータ変更はなし
変更したパラメータをエンコーダに通知
S1103
終了

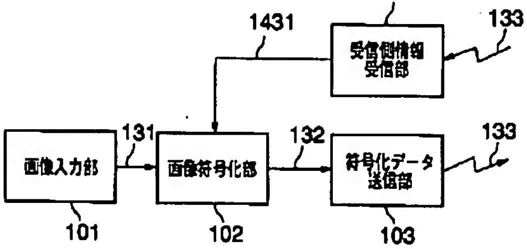
[Drawing 12]


Start
S1201
パケット損失がある?
NO
YES
S1202
前回も
パケット損失がある?
NO
YES
S1203
パケット損失率≧
前回のパケット損失率
NO
YES
S1204
無線等の誤りと判断
誤り耐性パラメータ
を調整
S1206
パケット損失率から
有効ビットレート
を算出
S1207
遅延>Th
NO
YES
S1208
遅延量から有効
ビットレート
を計算
S1205
変更したパラメータを
エンコーダに通知
S1209
ネットワーク状態に
依存するパラメータ
変更はなし
終了

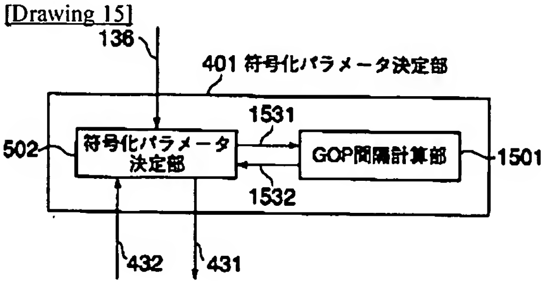
[Drawing 13]


131
132
133
画像入力部
画像符号化部
符号化データ
送信部
101
102
103

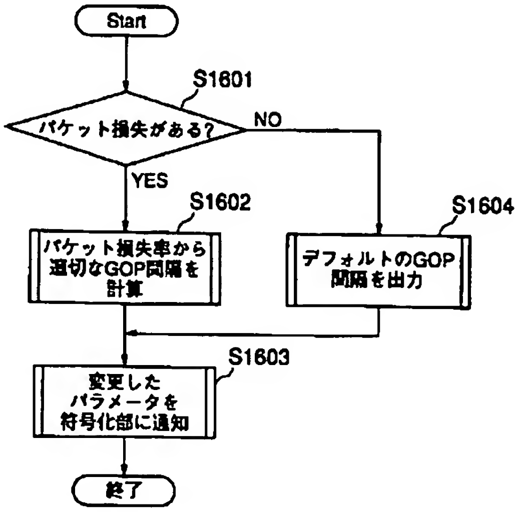
[Drawing 14]


1401
1431
133
受信側情報
受信部
131
132
133
画像入力部
画像符号化部
符号化データ
送信部
101
102
103

[Drawing 15]


136
401 符号化パラメータ決定部
1531
502
符号化パラメータ
決定部
GOP間隔計算部
1501
1532
432
431

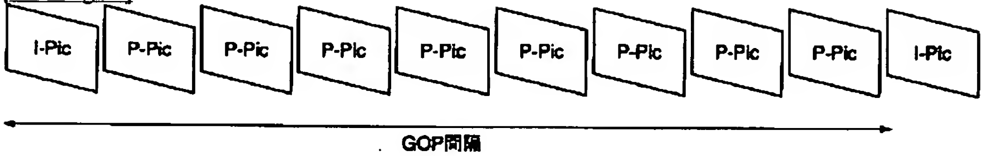
[Drawing 16]


Start
S1601
パケット損失がある?
NO
YES
S1602
パケット損失率から適切なGOP間隔を計算
S1604
デフォルトのGOP間隔を出力
S1603
変更したパラメータを符号化部に通知
終了

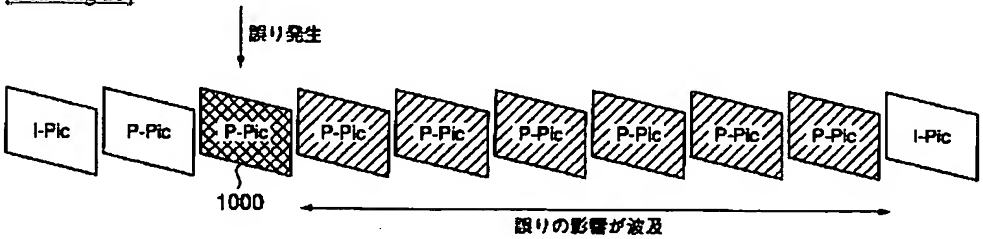
[Drawing 17]

ID=000019

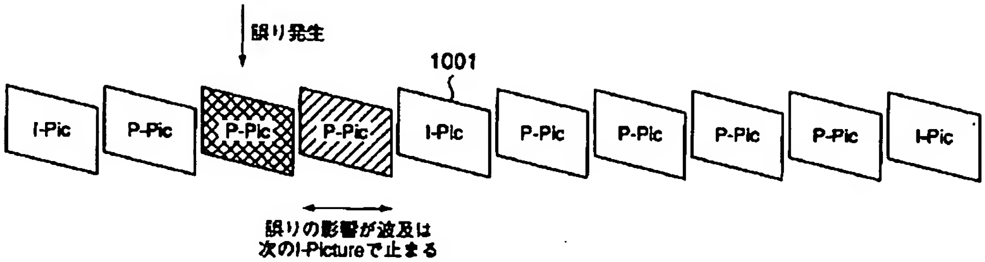
[Drawing 19]


I-Pic
P-Pic
P-Pic
P-Pic
P-Pic
P-Pic
P-Pic
P-Pic
P-Pic
I-Pic
GOP間隔

[Drawing 20]


誤り発生
I-Pic
P-Pic
P-Pic
P-Pic
P-Pic
P-Pic
P-Pic
P-Pic
P-Pic
I-Pic
1000
誤りの影響が波及

[Drawing 21]


誤り発生
1001
I-Pic
P-Pic
P-Pic
P-Pic
I-Pic
P-Pic
P-Pic
P-Pic
P-Pic
I-Pic
誤りの影響が波及は
次のI-Pictureで止まる

[Translation done.]